

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of the Application of)	
)	
STARSYS, INC.)	File No. _____
)	
For Authority to Construct a Low Earth)	
Orbit Communications Satellite to be)	
Stationed in an Inclined)	
Non-Geostationary Orbit)	

APPLICATION

STARSYS, Inc. ("STARSYS" or "Applicant"), pursuant to Sections 308, 309, and 319 of the Communications Act of 1934, as amended, hereby applies for authority to construct a low earth orbit communications satellite ("STARNET F21") that will operate in the 137-138 MHz frequency band for Space-to-Earth transmissions, and in the 148-149 MHz band for Earth-to-Space transmissions, or in sub-bands thereof, depending on frequency modulation selected by the Commission. STARSYS requests the Commission to allow STARNET F21 to be randomly deployed in a low earth, non-geostationary inclined orbit between 50 and 60 degrees.

The satellite for which construction authority is requested herein is an integral component of the STARNET system that is being developed by STARSYS. STARNET F21 is one of 24 in-orbit components of the STARNET system for which STARSYS is requesting Commission construction approval.

A. Applicant is:

STARSYS, Inc.
2000 K Street, N.W.
Suite 620
Washington, D.C. 20006

B. Correspondence concerning this application may be addressed to:

Dr. Ashok Kaveeshwar
President
STARSYS, Inc.
2000 K Street, N.W.
Suite 620
Washington, D.C. 20006

With a copy for Counsel:

Raul R. Rodriguez
Stephen D. Baruch
Leventhal, Senter & Lerman
2000 K Street, N.W.
Suite 600
Washington, D.C. 20006-1809

C. The radio frequency plan is set forth in Tables 1 and 2.

TT&C frequency assignments are intraband.

VHF band frequencies (using spread spectrum techniques) are:

Earth-to-Space (Uplink) 148 to 149.0 MHz

Space-to-Earth (Downlink) 137 to 138.0 MHz

(In the event that a non-spread spectrum basis is selected by the Commission, the STARNET component spacecraft will operate in sub-bands of these frequencies.)

D. Applicant requests authority to deploy this component of the STARNET system in an inclined (between 50 degrees and 60 degrees), non-geostationary, low earth orbit. A discussion of the factors influencing the orbit selection process is included in Part VII of the STARSYS application.

E. The STARNET system component's receive antenna gain contours and transmission antenna EIRP contours are stated below:

1. Outbound uplink channels analysis (ground station to satellite):

Ground station transmitting/channel	12 dBW
Ground station transmitter losses	-0.7 dB
G/T	+16 dBi
Max range (3500 km)	-146.6 dB
G/T at 5 degree elevation angle	+5 dBi
Satellite receiver loss	-2.5 dB
Polarization loss	-3 dB
To receiver	-201 dBW/Hz
9600 bps	39.82 dBHz
C/No	80.20 dBHZ
Eb/No	+4.5 dB
Uplink Margin	> 30 dB

2. Outbound downlink channels analysis (satellite to users' terminals)

Satellite transmitting/channel	9 dBW (7.95 watts)
Satellite transmitter loss	-0.7 dB
G/T at 60 degree off-axis	+4 dBi
Max range (3500 km)	-145.93 dB
G/T at 5 degree elev. angle	+2.5 dB
Terminal receiver loss	-2.5 dB
Polarization loss	-3 dB
To receiver	-200 dBW/Hz
9600 bps	39.83 dBHz
Eb/No with coding	+2.5 dB
Downlink margin	+3 dB
Power flux density at the ground (dBW/m ² /4 KHz) (1300 km)	-141.50 dBW/m ² /4 KHz

3. Inbound uplink channels analysis (terminal to satellite)

Ground terminal	0 dBW (1.0 watt)
Terminal transmission loss	-0.7 dB
G/T at 5 degree elev. angle	+3 dBi
Max range (3500 km)	-146.6 dB
Satellite G/T at 60 deg. off-axis	+4 dBi
Receiver loss	-2.5 dB
Multipath propagation effect	-3 dB
Polarization loss	-3 dB
To satellite	-201 dBW/Hz
4800 bps	36.82 dBHz
Eb/No (10 ⁻⁵) with coding	+4.5 dB
Uplink margin	+9.9 dB

4. Inbound downlink channels analysis (satellite to ground station)

Satellite transmitter/channel	-3 dBW
Satellite transmission losses	-0.7 dB
G/T at 60 degrees off-axis	+4 dBi
Max range (3500 km)	-145.93 dB
G/T	+16 dBi
Ground station receiver loss	-2.5 dB
Polarization loss	-3 dB
To receiver	-200 dBW/Hz
4800 bps	36.83 dBHz
Eb/No (10 ⁻⁵)	+4.5 dB
Downlink margin	+5.5 dB
Power flux density at the ground in any 4 KHz band (dBW/m ² /4 KHz)	-153.5 dBW/m ² /4 KHz

5. The communication system block diagram is shown in Figure 1.

F. Physical Characteristics of STARNET Components

The STARNET component spacecraft will be designed to meet the following antenna pointing accuracy requirements:

Pitch	+/- 5°
Roll	+/- 5°
Yaw	not required

The mission requires orientation of the antennas to approximate local vertical, with no requirement for yaw stability. A motorized boom provides the necessary inertia configuration for gravity-gradient stabilization. Energy dissipation for stability is provided by four passive magnetic hysteresis rods, one in each solar panel spar. Passive gravity-gradient stabilization such as this has been demonstrated on numerous spacecraft. Energy dissipation to assure stability will be provided by two passive ball-in-tube nutation dampers. Attitude knowledge is required to perform the maneuvers necessary for the stabilization adjustment phase. This is provided by a three-axis vector magnetometer and digital sun sensors. Magnetometer and sun sensor data are telemetered and ground processing enables attitude determination.

The STARNET component spacecraft will have a design lifetime of 5 years. Lifetime is determined by a number of factors including component failures, aging effects, and fuel depletion.

The power subsystem will have sufficient battery capacity to power the spacecraft during periods of solar eclipse lasting up to approximately 45 minutes. Details of the specific power subsystem design will be available when the spacecraft contractor has been selected during the competitive procurement phase.

G. Emission Limitations

Given the use of spread spectrum techniques and the fact that STARNET is a low earth orbit system, however, it is expected that the level of spurious emissions will be negligible. Applicant will minimize any spurious emission anomalies.

H. Dates by which construction will be commenced and completed, launch date, and estimated date of placement into service.

The complete constellation of twenty-four (24) STARNET in-orbit component spacecraft will be launched within forty-eight (48) months after Commission approval. Component spacecraft will be designed and quality controlled twelve (12) months after program inception. Delivery of STARNET component spacecraft will commence twenty-four (24) months after Commission approval. Manufacturers are to deliver three (3) component spacecraft per quarter over (8) quarters. Spacecraft integration on the launcher is four (4) months for the first launch, and one (1) month for subsequent launches.

Launches will be conducted at a rate of three (3) every quarter. The launch period will start in the fourth quarter of 1993 and continue into the third quarter of 1995, assuming Commission approval in the second quarter of 1991.

- I. The STARSYS application sets forth the public interest considerations, and the legal, financial, and technical qualifications of the Applicant. All information contained in the STARSYS application that is pertinent to this Application, but that may not be reproduced herein, is hereby incorporated by reference.
- J. STARSYS waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests construction authority in accordance with this Application. All statements made in the attached exhibits are a material part hereof, and are incorporated herein as if set out in full in this Application.
- K. The undersigned certifies for STARSYS that the statements made in this Application are true, complete, and correct to the best of his knowledge and belief, and are made in good faith.

WHEREFORE, STARSYS respectfully requests the Commission to grant this Application.

Respectfully submitted,

STARSYS, INC.

By: /S/ Ashok Kaveeshwar
Dr. Ashok Kaveeshwar
President

Date: May 4, 1990

TABLE 1

STARNET component spacecraft will operate on a Modified Primary Basis in the U.S. in the following VHF bands:

Nominally using spread spectrum techniques (Solution A)

Earth to space (uplink)	148	to	149.0 MHz
Space to earth (downlink)	137	to	138.0 MHz

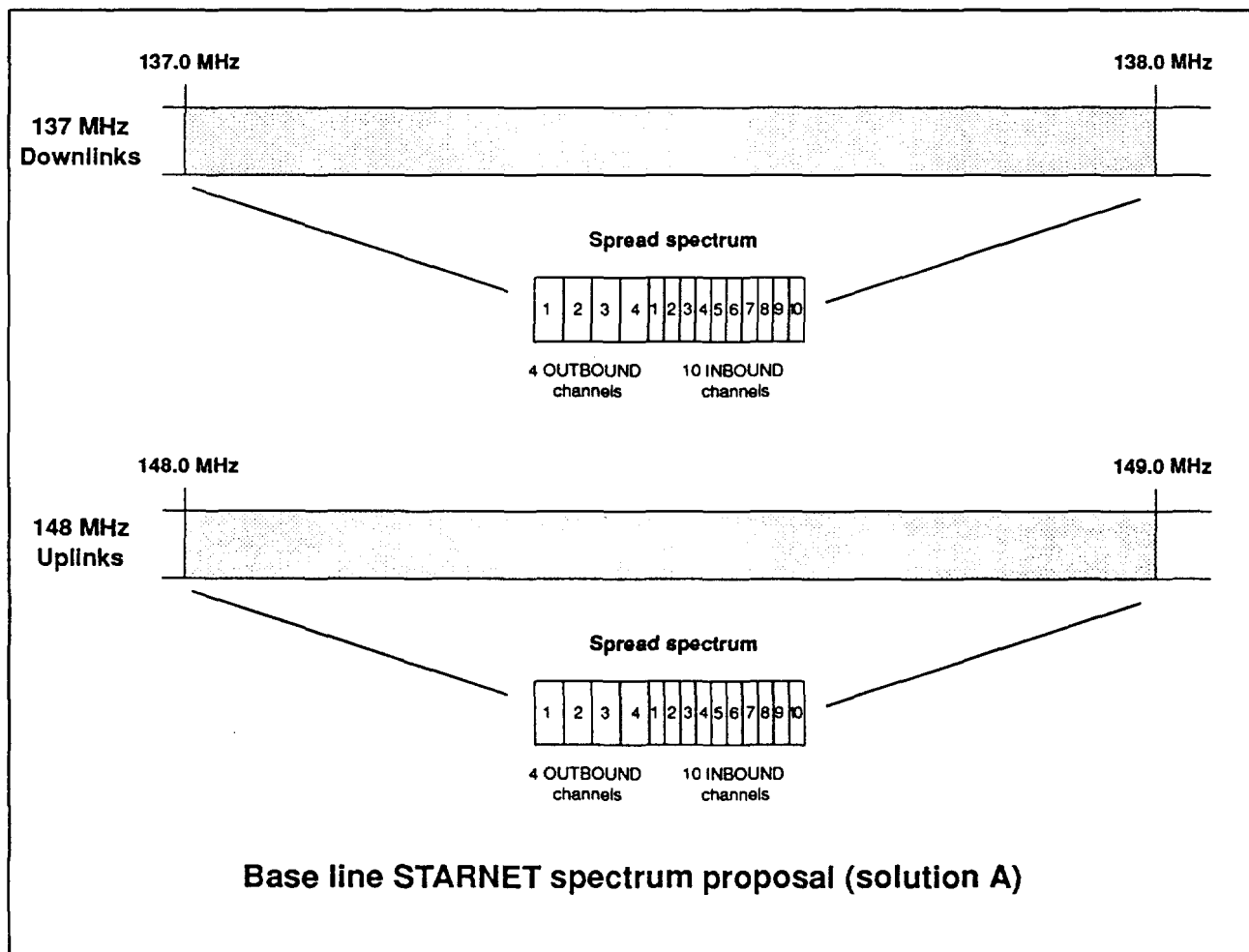
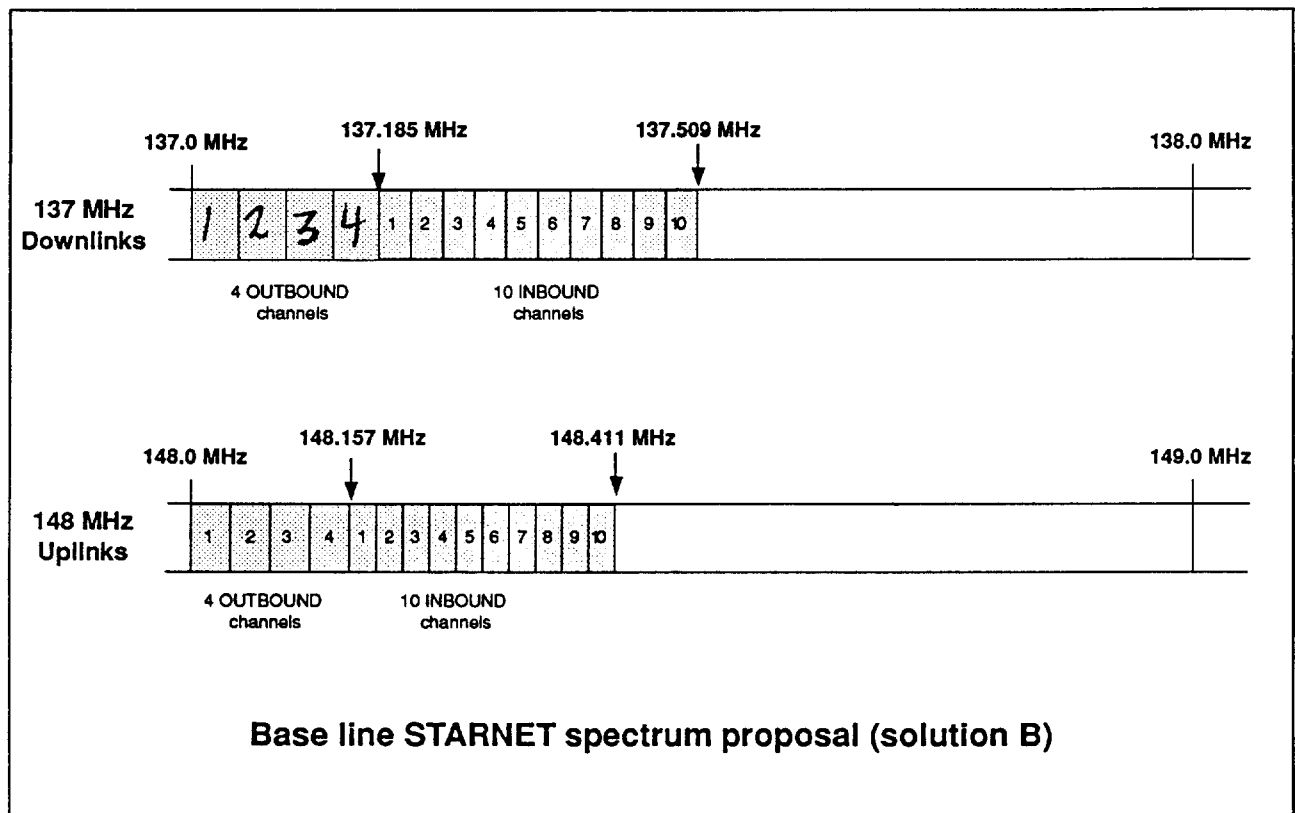


TABLE 2

**Or alternatively without using spread spectrum techniques
(Solution B)**

Earth to space (uplink)	148	to	148.411 MHz
Space to earth (downlink)	137	to	137.509 MHz



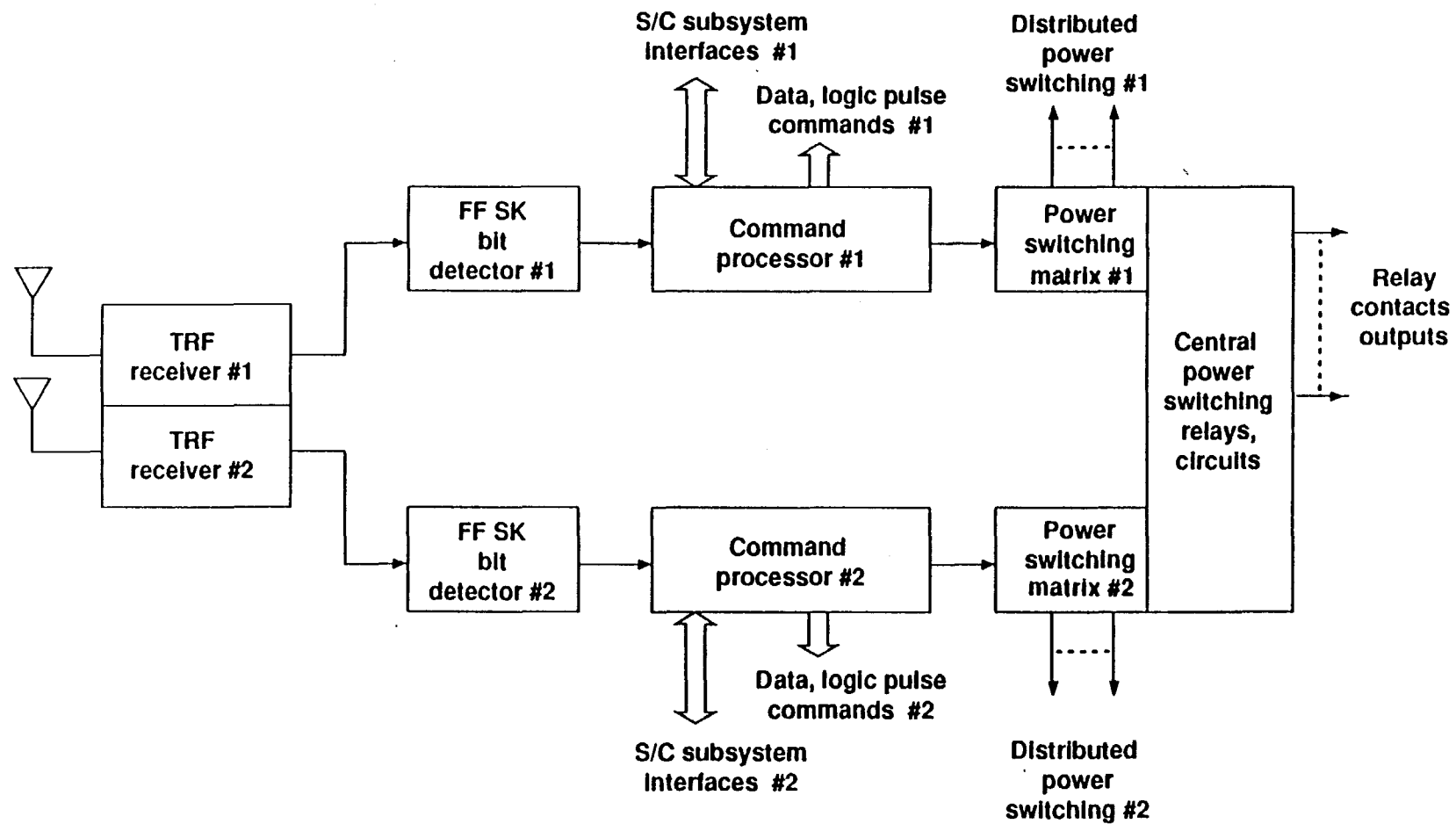


Figure 1

TAB

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APPLICATION

STARSYS, Inc. ("STARSYS" or "Applicant"), pursuant to Sections 308, 309, and 319 of the Communications Act of 1934, as amended, hereby applies for authority to construct a low earth orbit communications satellite ("STARNET F22") that will operate in the 137-138 MHz frequency band for Space-to-Earth transmissions, and in the 148-149 MHz band for Earth-to-Space transmissions, or in sub-bands thereof, depending on frequency modulation selected by the Commission. STARSYS requests the Commission to allow STARNET F22 to be randomly deployed in a low earth, non-geostationary inclined orbit between 50 and 60 degrees.

The satellite for which construction authority is requested herein is an integral component of the STARNET system that is being developed by STARSYS. STARNET F22 is one of 24 in-orbit components of the STARNET system for which STARSYS is requesting Commission construction approval.

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C. The radio frequency plan is set forth in Tables 1 and 2.

TT&C frequency assignments are intraband.

VHF band frequencies (using spread spectrum techniques) are:

Earth-to-Space (Uplink) 148 to 149.0 MHz

Space-to-Earth (Downlink) 137 to 138.0 MHz

(In the event that a non-spread spectrum basis is selected by the Commission, the STARNET component spacecraft will operate in sub-bands of these frequencies.)

D. Applicant requests authority to deploy this component of the STARNET system in an inclined (between 50 degrees and 60 degrees), non-geostationary, low earth orbit. A discussion of the factors influencing the orbit selection process is included in Part VII of the STARSYS application.

E. The STARNET system component's receive antenna gain contours and transmission antenna EIRP contours are stated below:

1. Outbound uplink channels analysis (ground station to satellite):

Ground station transmitting/channel	12 dBW
Ground station transmitter losses	-0.7 dB
G/T	+16 dBi
Max range (3500 km)	-146.6 dB
G/T at 5 degree elevation angle	+5 dBi
Satellite receiver loss	-2.5 dB
Polarization loss	-3 dB
To receiver	-201 dBW/Hz
9600 bps	39.82 dBHz
C/No	80.20 dBHz
Eb/No	+4.5 dB
Uplink Margin	> 30 dB

2. Outbound downlink channels analysis (satellite to users' terminals)

Satellite transmitting/channel	9 dBW (7.95 watts)
Satellite transmitter loss	-0.7 dB
G/T at 60 degree off-axis	+4 dBi
Max range (3500 km)	-145.93 dB
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Terminal receiver loss	-2.5 dB
Polarization loss	-3 dB
To receiver	-200 dBW/Hz
9600 bps	39.83 dBHz
Eb/No with coding	+2.5 dB
Downlink margin	+3 dB
Power flux density at the ground (dBW/m ² /4 KHz) (1300 km)	-141.50 dBW/m ² /4 KHz

3. Inbound uplink channels analysis (terminal to satellite)

Ground terminal	0 dBW (1.0 watt)
Terminal transmission loss	-0.7 dB
G/T at 5 degree elev. angle	+3 dBi
Max range (3500 km)	-146.6 dB
Satellite G/T at 60 deg. off-axis	+4 dBi
Receiver loss	-2.5 dB
Multipath propagation effect	-3 dB
Polarization loss	-3 dB
To satellite	-201 dBW/Hz
4800 bps	36.82 dBHz
Eb/No (10 -5) with coding	+4.5 dB
Uplink margin	+9.9 dB

4. Inbound downlink channels analysis (satellite to ground station)

Satellite transmitter/channel	-3 dBW
Satellite transmission losses	-0.7 dB
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Downlink margin	+5.5 dB
Power flux density at the ground in any 4 KHz band (dBW/m ² /4 KHz)	-153.5 dBW/m ² /4 KHz

5. The communication system block diagram is shown in Figure 1.

F. Physical Characteristics of STARNET Components

The STARNET component spacecraft will be designed to meet the following antenna pointing accuracy requirements:

Pitch	+/- 5°
Roll	+/- 5°
Yaw	not required

The mission requires orientation of the antennas to approximate local vertical, with no requirement for yaw stability. A motorized boom provides the necessary inertia configuration for gravity-gradient stabilization. Energy dissipation for stability is provided by four passive magnetic hysteresis rods, one in each solar panel spar. Passive gravity-gradient stabilization such as this has been demonstrated on numerous spacecraft. Energy dissipation to assure stability will be provided by two passive ball-in-tube nutation dampers. Attitude knowledge is required to perform the maneuvers necessary for the stabilization adjustment phase. This is provided by a three-axis vector magnetometer and digital sun sensors. Magnetometer and sun sensor data are telemetered and ground processing enables attitude determination.

The STARNET component spacecraft will have a design lifetime of 5 years. Lifetime is determined by a number of factors including component failures, aging effects, and fuel depletion.

The power subsystem will have sufficient battery capacity to power the spacecraft during periods of solar eclipse lasting up to approximately 45 minutes. Details of the specific power subsystem design will be available when the spacecraft contractor has been selected during the competitive procurement phase.

G. Emission Limitations

Given the use of spread spectrum techniques and the fact that STARNET is a low earth orbit system, however, it is expected that the level of spurious emissions will be negligible. Applicant will minimize any spurious emission anomalies.

H. Dates by which construction will be commenced and completed, launch date, and estimated date of placement into service.

The complete constellation of twenty-four (24) STARNET in-orbit component spacecraft will be launched within forty-eight (48) months after Commission approval. Component spacecraft will be designed and quality controlled twelve (12) months after program inception. Delivery of STARNET component spacecraft will commence twenty-four (24) months after Commission approval. Manufacturers are to deliver three (3) component spacecraft per quarter over (8) quarters. Spacecraft integration on the launcher is four (4) months for the first launch, and one (1) month for subsequent launches.

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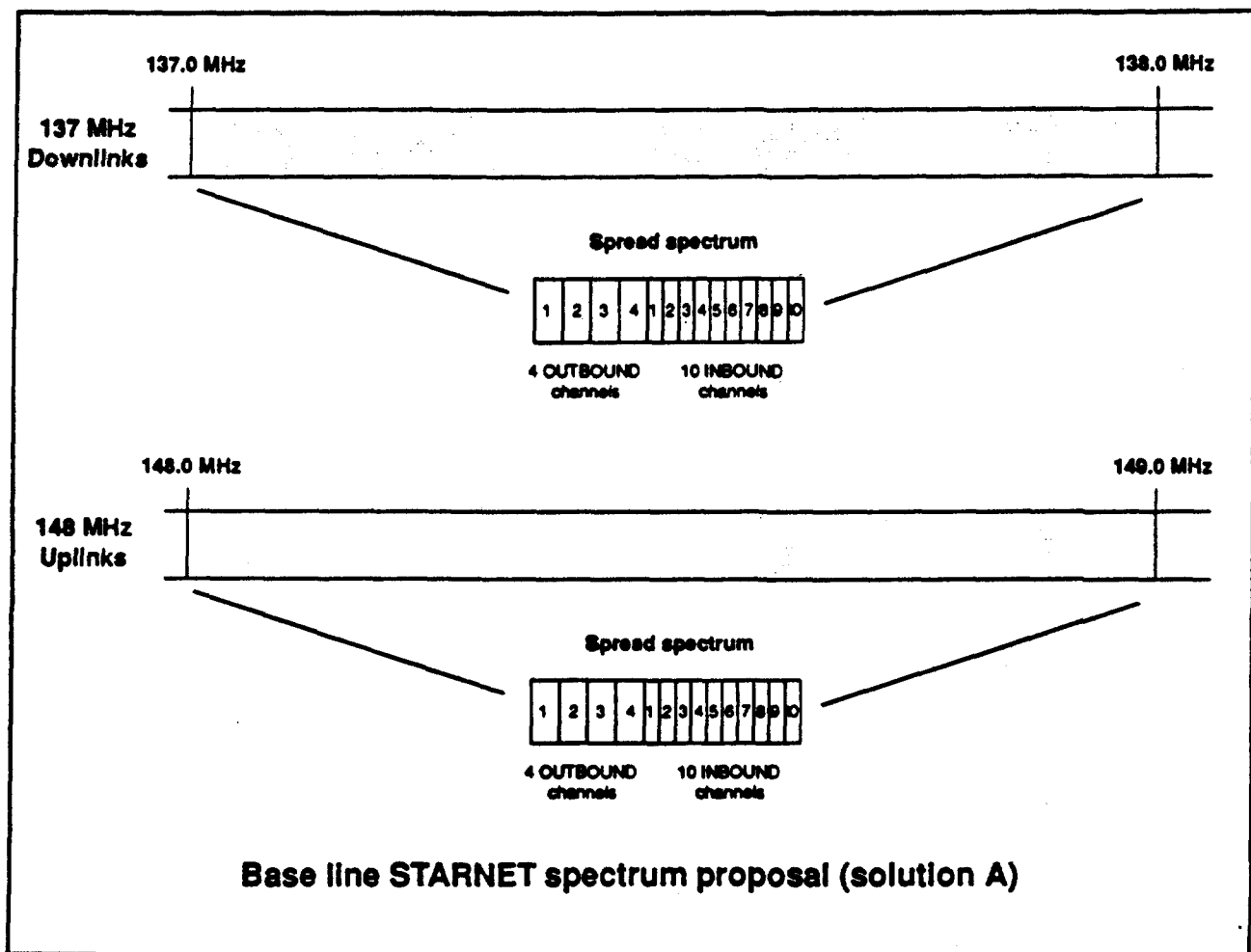
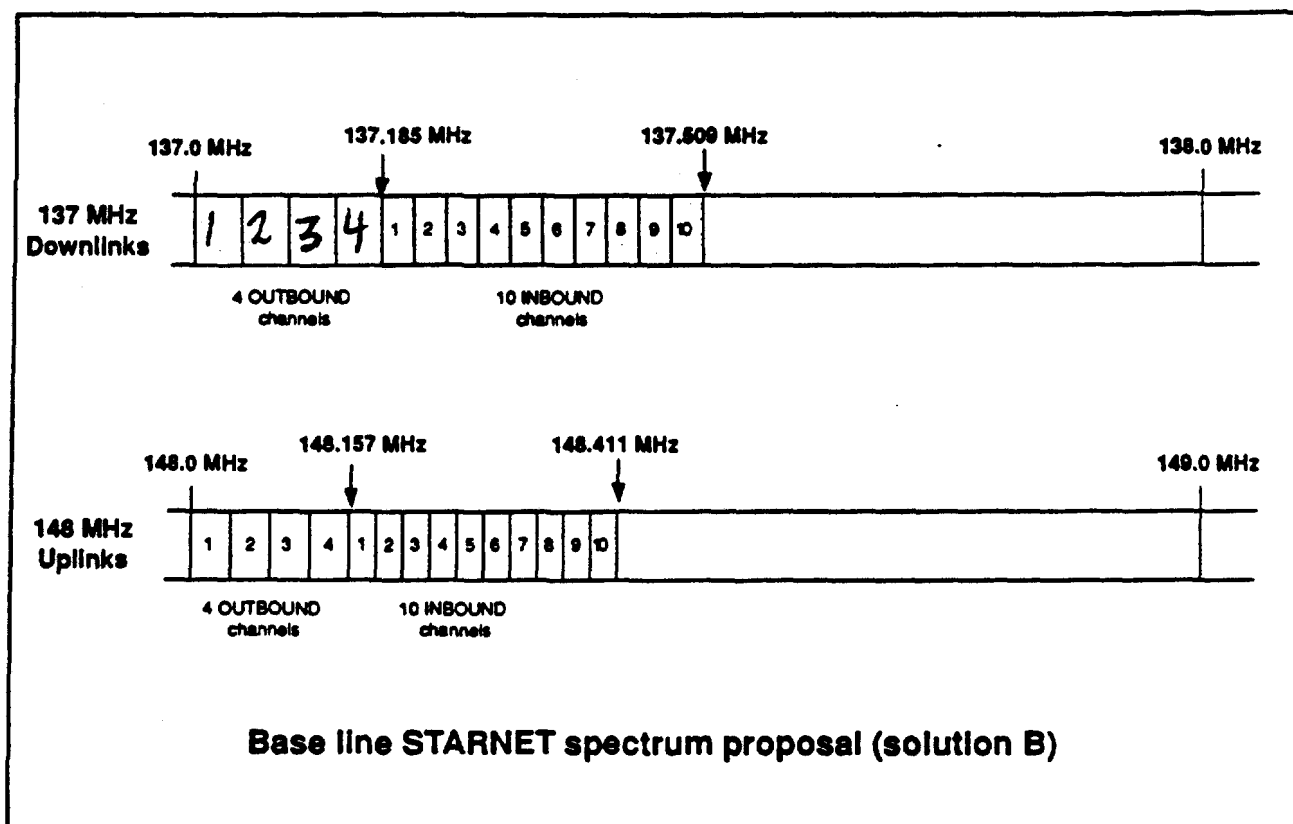


TABLE 2

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Earth to space (uplink)	148	to	148.411 MHz
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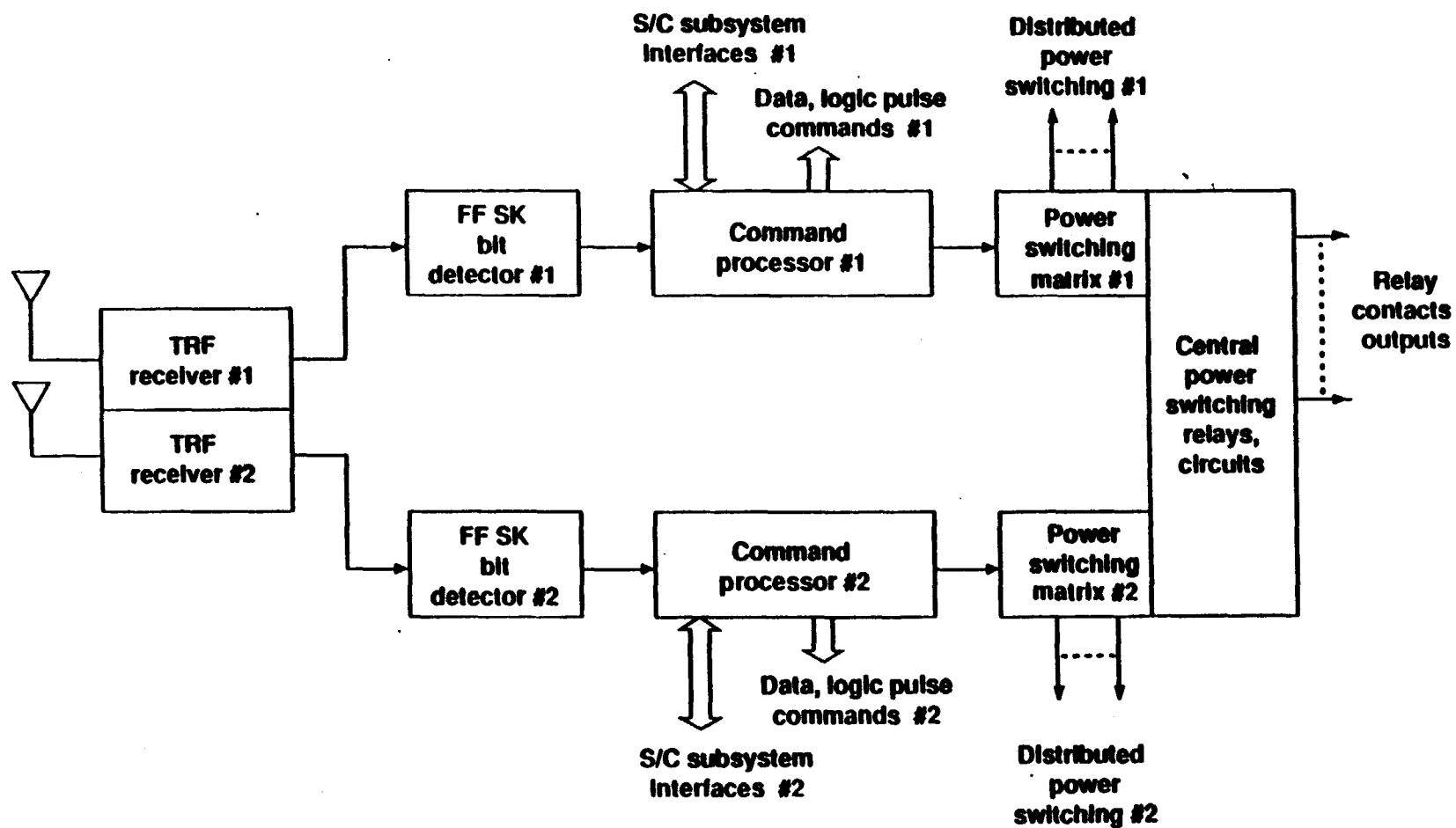


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APPLICATION

STARSYS, Inc. ("STARSYS" or "Applicant"), pursuant to Sections 308, 309, and 319 of the Communications Act of 1934, as amended, hereby applies for authority to construct a low earth orbit communications satellite ("STARNET F23") that will operate in the 137-138 MHz frequency band for Space-to-Earth transmissions, and in the 148-149 MHz band for Earth-to-Space transmissions, or in sub-bands thereof, depending on frequency modulation selected by the Commission. STARSYS requests the Commission to allow STARNET F23 to be randomly deployed in a low earth, non-geostationary inclined orbit between 50 and 60 degrees.

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A. Applicant is:

STARSYS, Inc.
2000 K Street, N.W.
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(In the event that a non-spread spectrum basis is selected by the Commission, the STARNET component spacecraft will operate in sub-bands of these frequencies.)

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9600 bps	39.83 dBHz
Eb/No with coding	+2.5 dB
Downlink margin	+3 dB
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